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AGRICULTURE AT THE UNIVERSITY OF ILLINOIS

A STATEMENT OF THE WORK AND NEEDS
OF THE COLLEGE OF AGRICULTURE AND
AGRICULTURAL EXPERIMENT STATION

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FOR THE INFORMATION OF
THE GOVERNOR
AND THE GENERAL ASSEMBLY

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Prepared by
the Dean and Heads of
Departments

URBANA - CHAMPAIGN

March, 1917

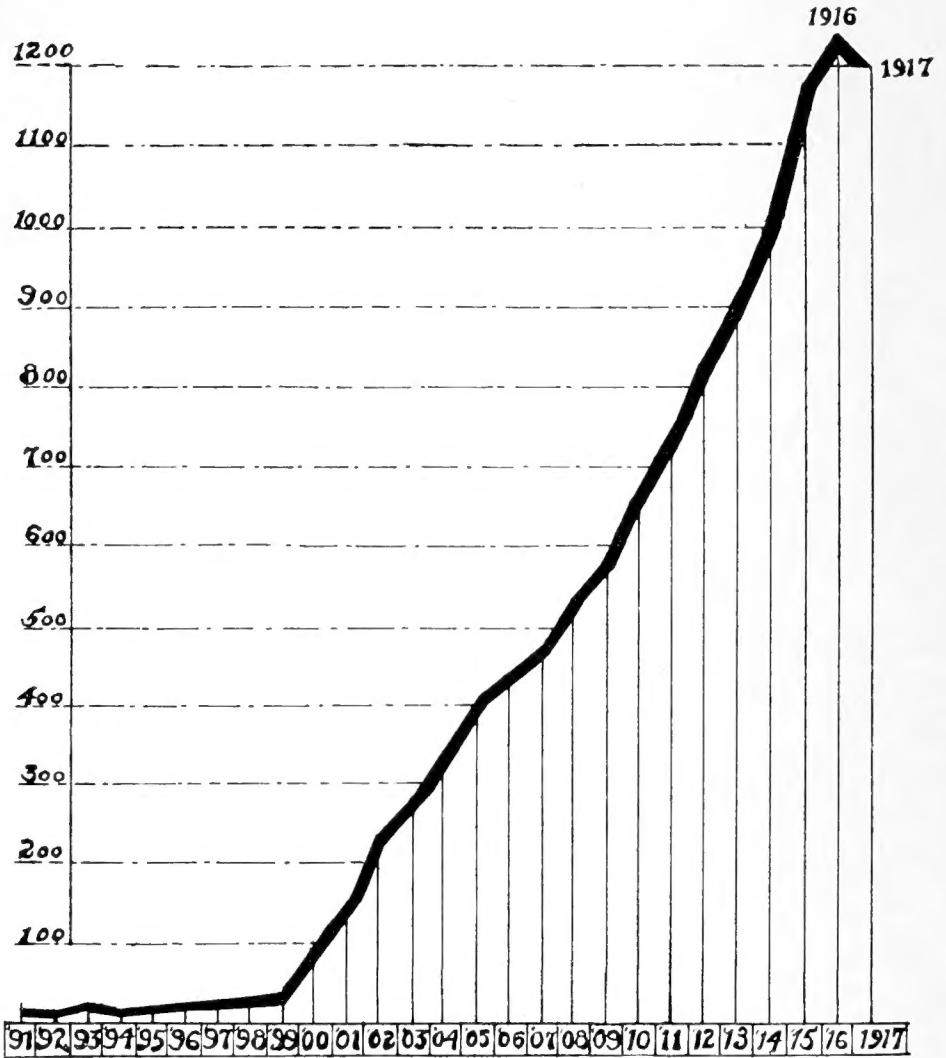
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This statement is prepared for the information of the Governor and General Assembly to show why the Agricultural College and Experiment Station are in need of larger resources and of a new Agricultural Building.

The wealth of Illinois is in her soil, and her strength lies in its intelligent development.—*Draper*



GROWTH IN STUDENT ATTENDANCE—COLLEGE OF AGRICULTURE,
UNIVERSITY OF ILLINOIS, 1891-1917

AGRICULTURE AT THE UNIVERSITY OF ILLINOIS

E. DAVENPORT, DEAN OF THE COLLEGE OF AGRICULTURE AND DIRECTOR OF THE
AGRICULTURAL EXPERIMENT STATION

THE Agricultural College and Experiment Station were established for the advancement of farming and housekeeping and the improvement of living conditions in the open country. They are organized under six departments:

AGRONOMY—covering crops, soils, and farm mechanics

ANIMAL HUSBANDRY—including horses, beef cattle, sheep, swine, meats, breeding, and feeding

DAIRY HUSBANDRY—dealing with dairy cattle, dairy farming, milk and its products

VETERINARY SCIENCE—covering the general subject of animal diseases and their control

HORTICULTURE—ranging from orchard fruits and vegetable gardening to landscape gardening and floriculture

HOUSEHOLD SCIENCE—treating of food, clothing, and shelter from the economic, the artistic, and the sanitary standpoints, especially in regard to the home

Each of these departments is organized to do work along three definite lines: (1) instruction of students, (2) investigation of unsolved problems, and (3) extension service to the people of the state outside the University.

Besides these subject departments, there is maintained an extension service for young people of the state and a special cooperative demonstration service with farmers and housekeepers.

A brief statement of the work of the departments is given in the succeeding pages by the several heads and in the order named.

THE STUDENT BODY

Of the 1,201 students registered up to February 23, 1917, 992 come from the state of Illinois; 186 from other states; and 23 from foreign countries, these latter bringing to the University and the student body a rich variety of agricultural practices from other parts of the country and the world. The 992 students coming from Illinois represent every county of the state except 9. The 209 coming from outside the state represent 36 states and 15 foreign countries.

Those coming direct from farms represent an average acreage of 275, but many poor boys avail themselves of the college as a means of gratifying

their desire to fit themselves for country life. One hundred and twenty-five, or 10 percent of the total number, come from Chicago, representing for the most part a pronounced and intelligent tide from the city back to the land. Investigations show that this latter group of students is not headed for the teaching profession or for public jobs, but for the farm, and many of them come from land-holding families. It is therefore a type of student very much to be desired.

Of the total number, 1,015 express decided church preferences and represent 28 denominations. These students, as well as many not expressing a preference, connect themselves in various ways with local churches, the work of the Y. M. C. A. and the Y. W. C. A. and other religious organizations.

WHERE THE GRADUATES GO AND WHAT THEY DO

There have graduated from the Agricultural College of the University, 943 students since 1900, and 53 before that date.

According to the latest available statistics, our graduates are engaged as follows:

- 69 percent are actually living upon farms and engaged in farming
- 17 percent are in agricultural departments of colleges, experiment stations, and high schools
- 10 percent are in occupations allied to farming, such as veterinary surgery, landscape gardening, creamery management, etc.
- Less than 4 percent are in occupations not allied to agriculture

It has been said that the agricultural college is educating away from the land. These figures, which are about the same as those published by other and similar institutions, show how easy it is for an untruth to gain circulation, especially when it is sensational. Clearly, the vast mass of our graduates follow the profession for which they are educated, and so far as our information goes, the proportion of non-graduates who return to the farm is even greater than these figures show, for the person who starts out to be a teacher must take his degree in order even to make a beginning; whereas, many farmers are able to take only one or two years of college work.

Nothing is clearer than that the Agricultural College of the University of Illinois is accomplishing the purpose for which it was organized.



EFFECTS OF SOIL TREATMENT

Clover on Fairfield Experiment Field, 1910. Where manure alone was used, the first crop (shown in the photograph) made about one-half ton of foul grass, with but little clover. Where the same amount of manure was used with limestone and phosphate, and with no potassium salts, the crop made nearly three tons of clean clover hay

DEPARTMENT OF AGRONOMY

SOILS, FARM CROPS, AND FARM MECHANICS

Prepared by Cyril G. Hopkins, Head of Department

“The farm is the basis of all industry, but for many years this country has made the mistake of unduly assisting manufacture, commerce, and other activities that center in cities, at the expense of the farm.”

These are the words of the late James J. Hill, himself a great railroad man, personally interested in commerce but fully alive to the meaning of agriculture.

One of the results of the early neglect of agriculture is shown in the fact that from 1880 to 1910, a period of one generation, 9,809,834 acres of “improved farm land” were agriculturally abandoned in New England, New York, New Jersey, and Pennsylvania, while the total area of land still being farmed in 1910 was only 9,216,519 acres in the eight states of New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, and Florida. By this we see that New England and three states lying to the west have already abandoned more land than is now farmed in seven of the thirteen original states with Florida added. This history of agriculture in our older eastern states must not be repeated in Illinois if we are to do our share in feeding our increasing population.

As agriculture is the basic support of all industry, so the fertility of the soil, as measured by the production of staple crops, is the foundation of all success in agriculture.

The latest report of the United States Bureau of Census places the annual value of all Illinois farm and garden crops at \$372,000,000 of which the five great staple farm crops—corn, oats, hay, wheat, and potatoes—represent \$345,000,000, or 93 percent of the total.

UNIVERSITY WORK IN AGRONOMY

The Department of Agronomy employs a force of more than forty teachers, investigators, and extension workers, besides the office and farm helpers. The annual appropriations used aggregate \$174,800, of which \$98,500, or more than half, is applied to the investigation of Illinois soils (tho this is less than 1 cent for every 3 acres of Illinois farm land, it is much more than any other state is devoting to the study of its soils); \$20,000 is available for investigations relating to farm crops; and \$56,300 for the instruction of students and for extension work in the general and special courses relating to soil physics and management, soil fertility, soil biology, crop production, crop improvement by plant breeding, land drainage, farm machinery, and farm buildings. (In addition, all soil reports, bulletins, and circulars relating to Agronomy are published with department funds.)

Investigations are carried on, not only in the laboratories and on the farms at Urbana, but also away from the University, as in the detail soil survey (now more than half completed), which is ultimately to cover every farm in every county, and on more than forty experiment fields well distributed over the entire state on the most extensive and important areas of the various soils of Illinois.

SOIL SURVEY AND FIELD INVESTIGATIONS

During the last two years, the soil survey has been completed in seven more counties, McHenry, Ogle, Grundy, Livingston, Champaign, Crawford, and White; the analytical work on trustworthy samples fairly representing different kinds or types of soil has made substantial progress; and the final soil reports have been published for the counties of Lake, Pike, McLean, Winnebago, Kankakee, and Tazewell.

These reports include: first, the soil maps showing the type or types of soil on every part of every farm; second, the analytical data giving the deficiency or abundance of the different elements of fertility in every type of soil; and, third, the record of results secured from actual trials on experiment fields representing the most important soils, demonstrating under normal field conditions the value of permanent systems of soil improvement and maintenance in contrast with the older and more common farm practice, which too commonly tends toward soil depletion.

A few typical illustrations of results secured in these field demonstrations may aid in a fair understanding of their value and influence:

On the Raleigh experiment field, in Saline county, the crop values¹ were \$5.52 from land with no soil enrichment, \$7.02 where the farm manure was applied in proportion to the crops produced, and \$12.30 where ground limestone was applied in addition to the farm manure. These results represent equal areas of land and the average of four different trials covering five years. The increase from the use of LIMESTONE was practically equal to the total produce from the unaided land. For this soil, limestone is the material of first importance, altho it is not the only thing required for the highest improvement.

On a very different kind of soil on the Green Valley experiment field, in Tazewell county, the value of produce was \$12.88 from land not enriched, while with the application of NITROGEN the value became \$30.35, making an increase of \$17.47 for the application of nitrogen, an element which science has shown to exist in the atmosphere in inexhaustible amounts and to be obtainable without purchase by the use of nitrogen-fixing bacteria. These results represent the average of triplicate trials covering six years on the Green Valley experiment field, showing that in this soil nitrogen is the limiting element.

¹Prices used: 50 cents a bushel for corn, 40 cents for oats, \$1 for wheat, and \$10 a ton for hay.

On the Manito experiment field, in Mason county, on another kind of soil, the land yielded produce valued at \$6.68 where no POTASSIUM was applied, but with this element provided the average value became \$20.02, as an average of triplicate trials over four years.

Neither nitrogen or limestone is needed on the Manito field, and where phosphorus was applied at a cost of \$3.00, the value of the increase produced by it was 65 cents on the Manito field and only 5 cents on the field at Green Valley. But, in contrast with these results, on the Bloomington experiment field, the common \$200 corn-belt prairie land of McLean county produced \$18.84 with no soil enrichment, \$29.88 where \$3.00 worth of PHOSPHORUS was applied, \$29.83 with phosphorus and nitrogen, \$30.01 with phosphorus, nitrogen, and potassium, and \$19.45 where the nitrogen and potassium were applied without phosphorus. These are the average results from field trials covering fifteen years, and plainly show that phosphorus is of first importance on this type of soil, which is general in central Illinois.

These markedly different treatments required on different types of soil strongly emphasize both the importance of soil investigations and their great practical value in accurately finding what is the limiting element. As a ten-year average, corn grown every year on unfertilized land on the University farm at Urbana produced 28.8 bushels per acre, while, with practical, scientific soil enrichment, corn grown every year in a good crop rotation averaged 79.5 bushels during the same decade.

The fact that all of the domestic animals on the farms of Illinois are equivalent to only one cow for more than 8 acres of our farm land lends additional interest to the rational use of other materials than farm manure for use in permanent, profitable soil improvement.

CROP INVESTIGATIONS

The improvement of crops in quality and yield by selection and breeding, the testing of varieties, and of methods of planting and tillage and care of crops, are likewise under active investigation, and, in these lines as well as in soils, the Department of Agronomy has made important discoveries and established principles of fundamental importance to Illinois agriculture: for example, that shallow cultivation of corn is better than deep cultivation; that the great value of cultivation lies not in the conservation of moisture, but in the eradication of weeds, and, consequently, that to cultivate corn more than is necessary to destroy weeds is unprofitable; that the planting of soybeans or cowpeas with the corn or at the time of the last cultivation does not increase, but decreases the yield of corn; and that extra deep plowing or subsoiling is detrimental rather than beneficial.

PUBLICATIONS

Some of the more recent investigations are reported in the following publications of the Agronomy Department issued during the last two years:

BULLETINS:

- 177 Radium as a Fertilizer
- 179 A Biochemical Study of Nitrogen in Certain Legumes
- 181 Soil Moisture and Tillage for Corn
- 182 Potassium from the Soil
- 183 Prices and Shrinkage of Farm Grains
- 190 Soil Bacteria and Phosphates
- 191 Yields of Different Varieties of Corn in Illinois
- 193 Summary of Illinois Soil Investigations
- 194 A New Limestone Tester
- 195 Yields of Spring Grains in Illinois

CIRCULARS:

- 181 How Not to Treat Illinois Soils
- 185 A Limestone Tester
- 186 I. The Illinois System of Permanent Fertility from the Standpoint of the Practical Farmer
- II. Phosphates and Honesty

SOIL REPORTS:

- 9 Lake County Soils
- 10 McLean County Soils
- 11 Pike County Soils
- 12 Winnebago County Soils
- 13 Kankakee County Soils
- 14 Tazewell County Soils

EXPERIMENT FIELDS

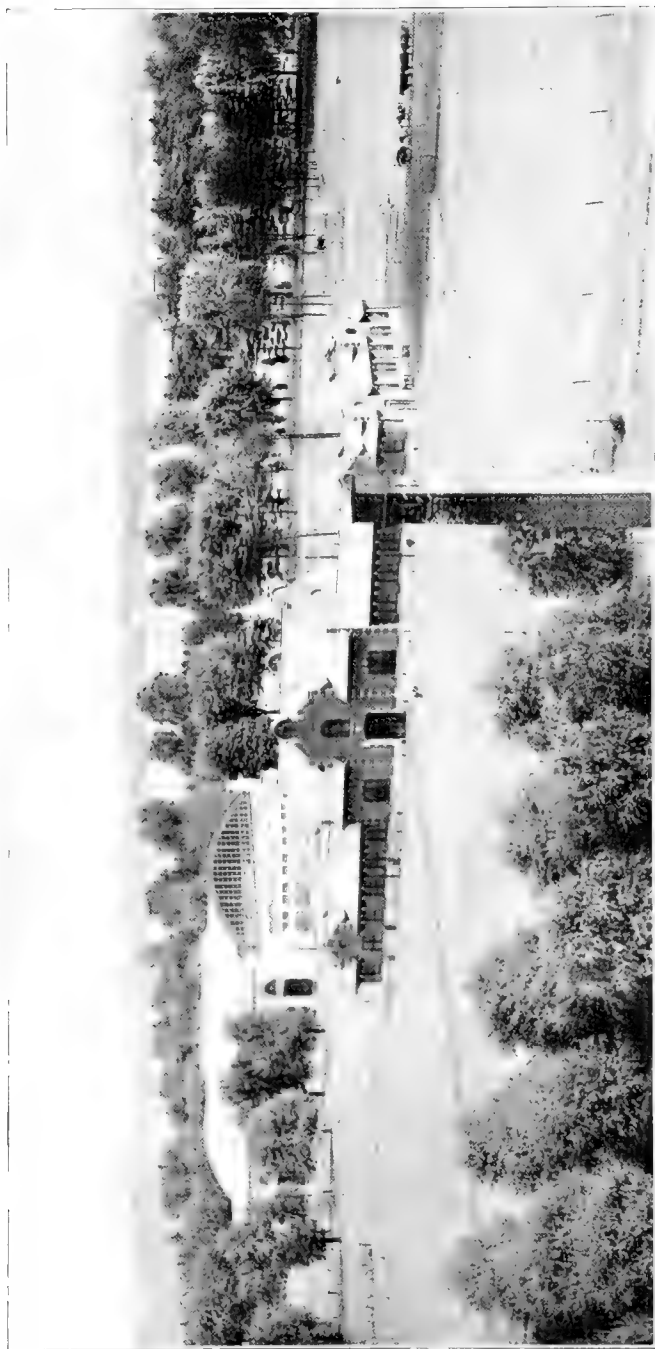
Because of their confidence in the practical value of the investigations conducted, many local communities have donated permanently to the University most of the tracts of land used by the Agronomy Department for experiment fields, such as the following, aggregating about 600 acres:

Aledo field, Mercer county	Minok field, Woodford county
Carlinville field, Macoupin county	Mount Morris field, Ogle county
Carthage field, Hancock county	Newton field, Jasper county
Clayton field, Adams county	Oblong field, Crawford county
Elizabethtown field, Hardin county	Oquawka field, Henderson county
Dixon field, Lee county	Pana field, Christian county
Enfield field, White county	Raleigh field, Saline county
Ewing field, Franklin county	Sidell field, Vermilion county
Hartsburg field, Logan county	Sparta field, Randolph county
Joliet field, Will county	Spring Valley field, Bureau county
Kewanee field, Henry county	Toledo field, Cumberland county
LaMoille field, Bureau county	Brookport-Unionville field, Massac county
Lebanon field, St. Clair county	West Salem field, Edwards county

NEEDS OF THE DEPARTMENT

The Department of Agronomy is greatly in need of additional appropriations in three lines; namely, \$15,000 a year for increased instruction and to provide for needed investigation in the subject of Farm Mechanics; \$10,000 a year for extending the investigations relating to Farm Crops; and a moderate sum to strengthen the faculty.

With these additions to the present funds, the department should be able to render reasonably well the service required by the people of Illinois.



STOCK, JUDGING PAVILION AND BEEF CATTLE BARN

DEPARTMENT OF ANIMAL HUSBANDRY

Prepared by Herbert W. Mumford, Head of Department

“FROM the most dependable statistics I have been able to secure, I find that in the United States, Illinois ranks second in the production of horses; fourth in the production of mules; fifth in the production of cattle other than milch cows; fourth in the production of cows; seventh in the production of sheep; and second in the production of swine. Illinois ranks third in the total value of its live stock. On January 1, 1916, the estimated value of live stock in the state of Illinois was \$332,911,000, being exceeded only by the states of Texas and Iowa.”¹

The work of the Animal Husbandry Department is directed along three lines: instructional, investigational or experimental, and extension.

INSTRUCTIONAL WORK

The instructional work of the Animal Husbandry Department for the year 1915-1916 included 28 undergraduate and 15 graduate courses, with a combined enrollment of 2,269. Of this number, 28 students were enrolled in graduate courses; 1,400 in judging; and the remainder in meat, breeding, feeding, and production courses.

The purposes of the courses offered are to familiarize the student with market and breed types of live stock; the principles underlying the feeding, breeding, and management of horses, beef cattle, swine, sheep, and poultry; the judging and selection of animals for breeding and for the feed lot; the methods of marketing; the slaughtering, cutting, handling, and curing of meats; and the chemical and physiological phases of animal nutrition. The graduate courses offer opportunities for advanced work in the various phases of animal husbandry. In addition to the regular staff of the department, leading authorities on the various phases of animal husbandry are invited to address the students at times best calculated to give to the student the greatest help.

The instructional work and other academic activities of the department are carried on by 28 individuals. Without attempting to give the distribution as between college, station, and extension work of each individual, it may be stated that on an average, 47.5 percent of the time of the staff is devoted to college, 44 percent to station, and 8.5 percent to extension work. In saying this, it should be understood that some men devote practically their entire time to the College; others to the Experiment Station; and still others to extension work. The general policy, however, is that, so far as practicable, each member of the staff does some teaching, some station work, and to a much less degree, some extension work.

¹From “The Live Stock Situation in Illinois,” an address delivered by Herbert W. Mumford to the Illinois State Farmers’ Institute, February 23, 1916.

The instructional work is facilitated by well-equipped laboratories, a Stock Judging Pavilion offering ample opportunity for the handling of large classes in the judging of live stock, and by a well-organized reading room.

The reading room contains about 2,000 volumes, among which are reference books, encyclopedias of animal husbandry, all publications of the Census Bureau and of the United States Department of Agriculture, many of the latest books published on the various phases of animal husbandry, and complete files of the American and British live-stock journals. In the reading room are also to be found 60 weekly and monthly live-stock journals and 15 daily live-stock market report papers. A new adjunct to the reading room which has greatly facilitated pedigree and breed history work is the herdbook room, into which have been moved the 75 sets of the different herd, stud, and flock registers. To further supplement the herds and flocks of the University, 1,000 or more lantern slides, charts, diagrams, photographs, and models are available for classroom purposes.

The College farm is stocked with herds, flocks, and studs which contain between 800 and 900 head of pure-bred and grade live stock, consisting of the leading breeds of horses, beef cattle, sheep, and swine, together with 2,000 domestic fowls. Experimental cattle to the number of 100 to 200 head are frequently a part of the equipment of the department. An effort is made to maintain creditable specimens of the leading breeds of live stock; and the flocks, herds, and studs of the University are rapidly coming to a grade of excellence where they are of interest, not only to the breeders of this state, but also to other states as well.

That the merits of the herds and flocks of the University are recognized by breeders of the country is indicated by the keen demand for breeding stock. In recent years breeding animals have been sold by the University¹ and shipped into California, Washington, Utah, Wyoming, Nevada, Colorado, New Mexico, Louisiana, Mississippi, Arkansas, Texas, Ohio, Michigan, Pennsylvania, Virginia, New Hampshire, South Carolina, New York, Missouri, Indiana, Iowa, and Kentucky, besides numerous shipments within the state.

The live-stock equipment of the department is necessarily expensive to maintain. The real purpose of this equipment being to furnish live stock for instructional purposes, it is not possible to manage them primarily from a commercial standpoint. Every effort is made, however, consistent with the fundamental purpose of keeping live stock on the College farm, namely educational, to keep the cost and maintenance down to the minimum and to dispose of discarded and surplus stock to the best advantage possible. In addition to the cost of feeding and housing the live stock, there is a large

¹It is significant that breeding stock has been sold from the beef cattle and sheep divisions of the department at higher prices than the University has ever paid for foundation animals in these classes of live stock.



POWER ON THE FARM

element of labor involved, not only in making it possible to present these animals to the students in the classroom in proper condition, but also in bringing the animals to and taking them from the Stock Judging Pavilion.

EXPERIMENT STATION WORK

The attention of the Beef Cattle division has been directed mainly along two lines: first, the continuation of the projects started in December, 1912, to determine the methods and cost of raising beef cattle on the high-priced lands of Illinois; and, second, the methods and cost of growing and fattening baby beeves. This division is also cooperating with the Nutrition division of the department in investigating the subject of silage and forage poisoning of live stock.

The Sheep division has been working on the different methods of raising and fattening lambs for the market. These investigations have involved the subject of the place of silage in the maintenance of the breeding flock and in fattening rations for sheep and lambs.

The Swine division is carrying on work to determine the cost of maintaining brood sows; the relative efficiency of light and heavy feeding; the amount of pork produced per bushel of corn consumed when pigs are allowed to gather the corn from the field as compared with methods of feeding which are commonly used; and the relative value of different forage crops in supplementing the grain ration for fattening hogs. The question of the use of the self-feeder is also under investigation.

The Horse Husbandry division has directed its attention to investigating the methods and cost of growing draft mares to two-year-olds, and the relative efficiency and cost of maintaining draft horses and mules for farm labor. Both of these projects are still in progress.

The division of Genetics has directed its attention along two lines: determining the independence or coupling in unit characters in the inheritance of mammals, and determining the mode of transmission of cloven and mule-foot condition in swine.

The investigational work of the Nutrition division has been centered upon two projects; the first consisting of a series of digestion experiments with pigs; and the second, an experiment to determine the nutritive value of the proteins of feeding stuffs.

The Farm Organization and Management division is conducting cost accounting investigations to determine the cost of producing crops and live stock as found under representative types of Illinois agriculture, and to study the relation of the various enterprises to the farm business as a whole. Particular attention is given to the study of the economic production of cattle and hogs, and to horse labor as a factor in the cost of producing farm crops.

PUBLICATIONS

The principal publications issued by the Animal Husbandry Department include the bulletins, which summarize the experimental work, and the circulars of information, which deal with experimental and general live-stock topics. Approximately 2,500,000 copies of these bulletins and circulars have been issued. That the reader may form a better idea of the nature and scope of the experiment station work of this department, the list of bulletins and circulars which it has issued are enumerated below.

BULLETINS:

- 73 Comparison of Silage and Shock Corn for Wintering Calves Intended for Beef Production
- 78 Market Classes and Grades of Cattle with Suggestions for Interpreting Market Quotations
- 83 Feeds Supplementary to Corn for Fattening Steers
- 90 Fattening Steers of the Various Market Grades
- 97 Market Classes and Grades of Swine
- 109 The Location, Construction, and Operation of Hog Houses
- 110 Storage Barns, Sheds, Feed Lots, and Other Equipment for Feeding Experimental Cattle in Car Load Lots
- 111 Maintenance Rations for Beef Breeding Cows
- 122 Market Classes and Grades of Horses and Mules
- 129 Market Classes and Grades of Sheep
- 141 Relative Efficiency of Different Rations for Fleshing Horses for Market
- 142 Short Fed Steers. A Comparison of Methods of Feeding
- 147 Market Classes and Grades of Meat
- 149 Tuberculosis of Farm Animals
- 150 Feeding Farm Work Horses
- 152 Contagious Abortion of Cows
- 158 Nutritive Value of the Various Cuts of Beef
- 163 The Maintenance Requirement of Swine
- 165 The Element of Uncertainty in the Interpretation of Feeding Experiments
- 166 Review of American Investigations on Fattening Lambs
- 167 Proportions of Shelled Corn and Alfalfa Hay for Fattening Western Lambs
- 168 A Study of the Development of Growing Pigs
- 169 A Study of the Ash Content of Growing Pigs
- 170 Coefficient of Digestibility of Some Common Rations for Swine
- 171 A Study of the Phosphorous Content of Growing Pigs
- 172 A Study of the Digestibility of Rations for Steers
- 173 A Study of the Forms of Nitrogen in Growing Pigs
- 192 Feeding Pure-Bred Draft Fillies

CIRCULARS:

- 48 The Characteristics of Stockers and Feeders
- 61 Supplement to Bulletin 73, Comparison of Silage and Shock Corn for Wintering Calves Intended for Beef Productions
- 65 Live Stock Investigations
- 79 Present Methods of Beef Production, I (Introduction)
- 83 The Swine Industry from the Market Standpoint
- 88 Present Methods of Beef Production, II (Fattening Cattle)

- 91 Present Methods of Beef Production, III (Hogs Following Cattle in the Feed Lot)
- 92 Present Methods of Beef Production, IV (Feeds and Their Preparation)
- 94 Present Methods of Beef Production, V (Breeding Beef Cattle for Market)
- 98 Present Methods of Beef Production, VI (Feed Lots and Shelter)
- 104 Detailed Bill of Material for Storage Barns, Sheds, Feed Lots, and Other Equipment for Feeding Experimental Cattle in Car Load Lots
- 125 The Sheep Industry from the Market Standpoint
- 126 Food Requirements for Growing and Fattening Swine
- 132 A Portable Panel Fence
- 133 Feeding the Pig
- 140 The Live Stock Situation in Illinois
- 153 Facts in Swine Feeding; Special Reference to Developing Swine for Breeding Purposes
- 161 Growing and Marketing Wool
- 163 Relation of the United States to the World's Beef Supply
- 164 Argentina as a Factor in International Beef Trade
- 169 A Review of Beef Production in the United States
- 175 Cattle Feeding Conditions in the Corn Belt
- 178 The Foot and Mouth Disease Situation

The bulletins on the Market Classes and Grades of Cattle, Horses, Swine, Sheep, and Meat are the only series of the kind ever prepared and are a valuable contribution to animal husbandry literature. At the time of the St. Louis World's Fair, 1904, the management considered the bulletin on Market Classes and Grades of Cattle (No. 78) of such great importance that the Department of Animal Husbandry was asked to prepare an exhibit which would represent the grades illustrated and described in this bulletin. This exhibit was prepared and pronounced the most valuable from an educational point of view of any live-stock exhibit in the entire show. A similar exhibit was made at the International Live Stock Exhibition the same year and has been similarly commended since that time. This material has often been used at our State Fair and at various exhibitions in this and other states, including the Panama Pacific International Exposition at San Francisco in 1915. The information it conveys becomes more significant each year.

Publications are in preparation by members of the department on such subjects as the relative cost of maintaining horses and mules for farm labor; the influence of one feeding stuff upon the digestibility of another; the individuality of pigs as to the completeness with which they digest their food.

BUILDINGS

With the exception of the brick Beef Cattle Building, erected 1904-1905, the college and station live stock are housed in frame buildings of a more or less temporary nature.

The Genetics Building (erected 1915-1916) is a one-story brick structure, 42 by 140 feet, containing the laboratories, offices, and animal rooms

of the Genetics division of the Animal Husbandry Department. The building is used for teaching purposes and for the investigation of the transmission of characters in animals and plants with particular reference to domestic animals.

The Stock Judging Pavilion (erected 1913) is a fireproof building, 54 feet high on the front and 148 feet deep, with circular ends 92 feet in diameter and 20 feet high. The exterior is brick and terra cotta, renaissance in design, the frieze being enriched with medallions of animal heads, representing modern breed types of the various classes of live stock. The total ground area is 30,000 square feet; the show arena is 220 feet long and 65 feet wide with a seating capacity of 2,000. Four classes of 40 students each can be held in the arena at the same time. The building also contains classrooms and offices. There are approximately 1,400 enrollments in regular classes using this building during the school year.

The Cattle Feeding Plant, now under construction, will be 374 feet long when completed. The main part of the plant is to be 52 feet wide and over 50 feet high, having a storage capacity of 400 tons of hay, 13,000 bushels of small grain, and 7,000 bushels of ear corn. In addition to the main plant there will be a battery of 4 silos, each 16 by 70 feet, with a total capacity of over 1,000 tons. Two of these have already been built. The plant will be equipped with machinery for the efficient handling and preparation of feeds. The feeding lots, which are to extend out 30 feet from the building line, will be paved. The maximum capacity of the plant will be 200 head of mature cattle.

The equipment for investigational work in Animal Husbandry consists of laboratories for analysis of feeding materials and excreta, and for research work in the more advanced chemical and physiological phases of animal nutrition; breeding laboratories for experimentation on mice, rats, rabbits, guinea pigs, and other suitable mammals; cold storage rooms and other equipment for conducting tests in cutting and handling meats; frame buildings for the housing of the various kinds of live stock, with the appliances necessary for individual and collective feeding tests, paved and unpaved feeding lots; and open sheds for experimentation with horses, cattle, sheep, and swine.

EXTENSION WORK

A summary of the work of the Animal Husbandry Department should not fail to include that part which is offered directly to the people.

During the past year the extension activities of the department reached into 44 counties of the state. Lectures were delivered at farmers' institutes, extension schools, farm management associations, county advisers' meetings, live-stock and breeders' association meetings, the Boys' State Fair School, teachers' and parents' meetings in schools, county fair schools, and corn

shows. Fifteen of the members of the department delivered extension lectures, thru which 15,222 people were reached.

NEEDS OF THE DEPARTMENT

Beef Cattle Division. The completion of the beef cattle feeding and storage plant is urgently needed. It is designed to make the latter a central storage plant for all classes of live stock, and until this is secured we shall not be able to purchase feeds as economically as can be done with suitable storage facilities.

Meat Division. A laboratory for slaughtering, ripening, curing, and cutting meat is needed. This laboratory should be of sufficient size to take care of students registered in the meat courses, and, manifestly, some of their activities in handling meat would include more than is indicated above. The enrollment in the meat courses at the present time is about 40, but a special effort has been made to keep this enrollment down to a small number as the division is not in a position to handle larger numbers. This laboratory should be equipped for conducting experiment station work as a supplement to our present live-stock production investigations.

Horse Division. One of the chief limitations to the development of our courses in horse husbandry is a lack of available high-class horses. If the stabling in connection with the Stock Judging Pavilion, as originally planned, could be provided, it would make it possible for us to secure material additions to our equipment by loans from breeders and exhibitors who will not run the risk of sending their stock here now in the absence of sanitary stabling.

Swine Division. With the purchase of the Lindsey farm and the location of the new beef cattle feeding and storage plant in close proximity to the old swine husbandry location, it is contemplated to move the swine to a portion of the Lindsey farm. This will make it necessary to rebuild the swine plant. Fortunately, no expensive buildings have been erected at the old plant, but provision should be made, within the next two years, for the erection of suitable buildings to quarter this division of our department.

Cottages for Herdsmen and Shepherd. With the growth of the University and the necessity for moving our live stock farther away from the campus, it becomes increasingly necessary to provide cottages in which the herdsmen and shepherd can live in close proximity to their work. The policy of providing cottages for such men has long been under consideration, and efforts have been made properly to care for the work by other methods, but the departmental staff have come to the conclusion that this is the most satisfactory and the only safe method of caring for our live-stock equipment. At present there should be provision made for erecting a cottage for the beef cattle herdsman, another for the swine herdsman, and a third for the shepherd who looks after the University flock.

Animal Pathology. Students specializing in Animal Husbandry are handicapped at present thru a lack of opportunity to take work in animal pathology or veterinary science. It is true, too, that some of the investigations, particularly the one in forage poisoning, are being hampered by the lack of a competent animal pathologist who has been trained for such work.

Animal Nutrition Division. For both the research and instructional work, the Nutrition division needs a larger laboratory for the experiments with animals, a laboratory which would include 12 feeding stalls for pigs and sheep similar to the four new stalls in the Beef Cattle Building for cattle and horses. In this same connection about three times as much space as we now have in the Beef Cattle Building is needed for the sampling of feeds, for the storing of feeds, and for the weighing of feeds and excretory products. The Nutrition division needs a bomb calorimeter for the purpose of computing the heat of combustion of the feeding stuffs that are being used in the nutrition experiments and also for the purpose of analyzing the feeding stuffs which other members of this department are using in connection with their work.

Poultry Division. The Poultry division needs strengthening. The work is now advanced to a point where the major part of the time of one man is required to care for the extension calls. There should be one or possibly two new men added to this division as soon as practicable. The University of Illinois is doing less in poultry husbandry than possibly any college or experiment station of good standing in the United States, and even than less important stations. Thus far, only temporary, inexpensive buildings have been erected for housing the poultry. The building equipment is entirely inadequate properly to care for present activities, to say nothing of any development of the work. It will be necessary in the very near future to erect more and better structures for this purpose.

Land. The land devoted to farming and experimental purposes under the supervision of the department now comprizes 355 acres, 80 of which are rented. If the department were provided with sufficient land to grow all of the feed necessary fully to maintain its live-stock equipment, from 600 to 700 acres would be required. It is necessary that sufficient corn be grown to fill the silos and provide sufficient pasturage for the live-stock equipment. It is felt that the present acreage of 355 acres, 80 of which, it should be borne in mind, are rented, is the minimum amount of land with which this can successfully be done. To be assured that land will be available as needed, the University should acquire either the 80 acres now rented by the department or its equivalent elsewhere. This, as has been said, would be a minimum; it would be advisable to have available for the use of the department at least 400 acres.



A CLASS IN DAIRY HUSBANDRY

DEPARTMENT OF DAIRY HUSBANDRY

Prepared by H. A. Harding, Head of the Department

THE steadily increasing cost of human food is producing a shift toward dairying in the agriculture of the state. This in turn is bringing increasing demands upon the Department of Dairy Husbandry.

COURSES OF INSTRUCTION

The teaching problem of the Dairy Department is to train students along the lines of the production, manufacture, and marketing of milk and its products. In doing this it offers 21 different courses of instruction, which, during the present year have had a total enrollment of slightly over 700 four-year students.

Notwithstanding this evident interest in the subject, as shown by the large number of students enrolled in the dairy classes, the teaching of the subject is in several respects not as well developed here as it is at the Agricultural Colleges of Wisconsin and Iowa, our neighboring institutions in states where dairying has essentially the same importance as in Illinois. Our present limitations as to men, equipment, and buildings will be discussed under the heading of department needs.

EXPERIMENT STATION WORK

The inevitable high cost of all food is constantly raising questions as to various methods by which the cost of production of dairy products may be reduced. The following studies are being made of various aspects of this cost question.

The question of calves and calf raising has been stimulated by the increasing price of dairy cows and the increasing need of cows that shall be economical producers of milk. From careful studies of the growth and development of 125 calves, fed upon various combinations of the ordinary farm feeds and manufactured feeds, it has been concluded that while hay and various cereals and their products may early become an important part of the food of the calf, satisfactory development does not appear possible without the liberal use of whole or skimmed milk during the first two or three months of its life.

Closely connected with calf raising is the question of the influence which the feeding and development of the calf and heifer up to the time of freshening may exert upon the milk production of the resulting cow. Manifestly this is difficult to measure because of the large influence of breeding upon milk flow and the difficulty of getting a sufficient number of experimental calves of the same or like breeding, but investigations are under way looking to a solution of the problem. So far as the experiment has gone the variations in feeding before freshening have resulted in distinct differences in the size of the cows and their ability to produce milk.

Labor is an increasingly important factor in milk production and has led to much consideration of the milking machine. Studies of the effect of the machine upon the lactation period of cows and heifers, upon the amount of milk produced, and upon the relative cost of machine milking and hand milking have been in progress for some time. The conclusions which appear evident at the present time are that when properly handled the milking machine has no objectionable results upon the cow and in large herds it is economical from the standpoint of labor. As they are ordinarily handled, however, milking machines increase the germ life of milk and have an undesirable effect upon the keeping quality of the milk.

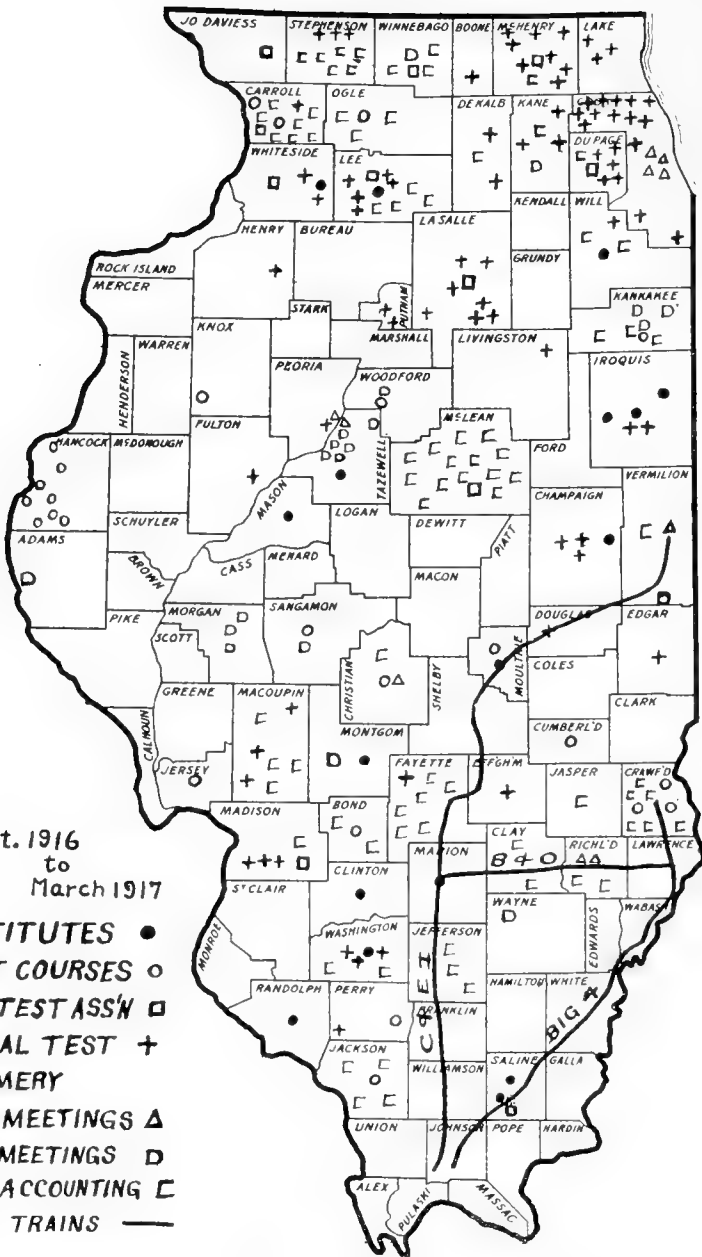
An investigation is being made of the causes that influence the germ content of milk. The wholesale price of milk produced in Illinois each year for the city trade amounts to about \$30,000,000. Because of the relation of the milk business to the public health, many municipalities have formulated stringent regulations concerning the production and handling of milk. While these regulations have been made in good faith, they frequently require the producer or the handler to go to considerable expense in matters about which there is no exact information as to their importance.

The studies undertaken have already emphasized the fact that too much stress has been laid upon the matters of barn construction and general appearances, which have really very little effect upon the quality of the milk. On the other hand, they have served to emphasize the overshadowing importance of the condition of the pails, strainers, and cans with which the milk comes in actual contact. Even when these are clean, in the ordinary meaning of that word, they are frequently so highly populated with germ life that the milk is promptly started on the road to souring. Studies are now under way to determine the most practical methods of handling the utensils in order to have them in satisfactory condition for handling milk.

As the result of these studies it is hoped that the cities of the state will remove those restrictions upon the milk business which increase the cost of production without serving any useful purpose. At the same time the dairymen should be enabled to produce a better milk at a smaller cost.

The above studies aim at reductions in the cost of the milk production by making possible improvements at individual points. At the same time a more accurate knowledge of the total cost of milk production, as well as knowledge of the comparative importance of the various factors that together make up this total cost, is of considerable importance. In order to secure accurate information, since exact data were not available, two lines of study have been carried out:

(1) A survey has been made of the conditions on 725 dairy farms in northern Illinois. Careful study of the data shows that the question of costs is very complex and that the actual cost of production varies, not only with the individual cow, but also with the individual farm in each community and with the type of dairying in which the community is



EXTENSION ACTIVITIES OF THE DAIRY DEPARTMENT

engaged. (2) A complete system of farm accounts has been carried out with a considerable number of dairymen in different parts of the state. This kind of data has accumulated thru four seasons and forms a valuable check upon the conclusions which seem to follow from the survey.

The above are given as examples only of the kind of service rendered by the department.

EXTENSION WORK

At present, in the Department of Dairy Husbandry, extension work occupies the full time of two men and a considerable portion of the time of six others. With this allotment of men satisfactory attention cannot be given to this work, for which there is a large and growing demand.

For a number of years the department has cooperated with the officials of the various dairy breed associations in conducting official tests of milk production in pure-bred dairy herds within the state. These tests are of two general types—short-time tests and tests extending over an entire year. During the year ending December 31, 1916, the department conducted short-time tests on 426 cows in 61 different herds, and yearly tests on 224 cows in 37 different herds. These tests included representatives of six different dairy breeds.

Just before the outbreak of foot-and-mouth disease there was manifest a growing interest in cow-testing associations in this state. With the disappearance of the disease the interest has again appeared. Since June 1, 1916, seven new associations have been formed and are now in working order, and a number more will undoubtedly be formed as rapidly as satisfactory men can be found to act as testers. Where these associations are provided with the right man as a tester, they are of great good in increasing the quality of the herds of a community.

The wave of interest in dairying which is now sweeping over this state has led to considerable attention to calf raising and calf clubs. Where these clubs secure desirable calves at reasonable prices and have good instructions regarding the development of calves into dairy cows, they will undoubtedly be of benefit to individuals and to the dairy industry. Recognizing the newness and complexity of the calf club situation, the extension forces of the College of Agriculture have entered into cooperative relations with the State Dairymen's Association in the carrying on of this work.

It is a matter of common knowledge and regret that only about 15 percent of the creamery butter made in the United States is of first quality. The reason for this lies in the poor condition of the cream at the time it is received by the creamery. The problem of the improvement of cream has for some time interested the Illinois Butter-manufacturers' Improvement Association. Evidently the method of improvement lies in paying a higher price for the sweeter cream based on some method of grading. In order to assist in working out this cream-grading plan, an extension man has been delegated to work with the creamery men on the problem.

In view of the growing interest in dairying in southern Illinois and the desirability of coming into touch with a wide extent of territory, the department, in cooperation with the railroads and in one instance with the State Dairymen's Association, assisted on dairy trains during this winter thru the region from Danville to Cairo and from Lawrenceville to Salem, in this way presenting dairy facts to approximately 25,000 people.

In addition to extension work along these definite lines, the department is represented at farmers' meetings of all kinds and in consultation with various groups in connection with agricultural problems.

The general distribution of the extension activities are shown by the map opposite the preceding page.

NEEDS OF THE DEPARTMENT

The needs of the Dairy Department may be briefly enumerated under the headings of Space, Men, and Equipment.

Space. The specimens of the various dairy breeds in use for teaching purposes are now housed in the original Agricultural College barn. This building has practically outlived its usefulness and must soon be rebuilt. A new building combining the purposes of a barn, with silos and other necessary equipment, and a laboratory adapted for both teaching and investigation, would probably cost about \$20,000.

Nowhere is space more needed than in the creamery. Four years ago the space allotted to it was believed to be fully occupied. Since then the machinery used in the instruction of ice-cream making and city-milk handling has been installed. The result is that while there is something illustrative of practically every side of dairy manufactures, there is not space enough to treat any side fairly.

The retail city milk business in this state amounts to over \$50,000,000 per year, while the machinery illustrative of it is crowded into a space 20 feet square. The ice cream business, while less in amount, is important and growing rapidly, but its space allotment is necessarily quite as meager.

Laboratory space for proper teaching in connection with city milk problems is simply not to be had. A laboratory for dairy physics is needed quite as much as one for dairy chemistry, for the entire group of processes included in dairy manufactures is applied physics; but again space is lacking.

Men. As the department is now equipped, it is about four men short. If sufficient laboratory space could be provided to accommodate the students who desire to take work in courses now offered, the shortage of men would be considerably increased.

Equipment. The equipment that has been provided is of good quality and on the whole as abundant as the space relations make desirable. However, as soon as adequate space is made available, equipment should be provided, and in the development of the suggested new laboratories new equipment will of course be needed.



OLD HORTICULTURAL BUILDING, NOW USED FOR
MILITARY PURPOSES



PROPOSED NEW HORTICULTURAL GROUP

DEPARTMENT OF HORTICULTURE

Prepared by J. C. Blair, Head of the Department

THE work of the Department of Horticulture is carried on in five divisions: Pomology, or fruit growing; Olericulture, or vegetable gardening; Floriculture; Landscape Gardening; and Plant Breeding.

Twenty-three members of the staff are engaged in instructional work, which is given in all these divisions except plant breeding. Most of them also devote a part of their time to research work in the Experiment Station.

INSTRUCTION

During the present year (1916-17) there are a total of 1,615 registrations in the 55 different courses offered by the department. The courses and enrollments are distributed as follows: general horticulture, 2 courses, 562 students; pomology, 11 courses, 134 students; olericulture, 3 courses, 21 students; floriculture, 12 courses, 197 students; and landscape gardening, 27 courses, 701 students.

Instruction in general horticulture is given for the most part by members of the division of Pomology. An elementary course in general horticulture is required of all freshmen in the general course in agriculture, consequently there is a large registration in this work each year.

The registration in the division of Landscape Gardening, 701 for the past year, places this school first in the country in point of attendance. The first professorship in civic design in the United States was established in 1914 in connection with the work in this division.

In addition to the regular horticultural courses this department offers two professional courses, one in floriculture and one in landscape gardening, both leading to the degree of bachelor of science. Twenty-two students are registered in the professional course in floriculture, and 65 in the professional course in landscape gardening.

Graduate Instruction. Four of the fifty-five courses of instruction offered by the department are graduate courses, and cover special problems in three of the divisions. Seven graduate students are registered in pomology, 3 in olericulture, and 6 in floriculture. It is planned to extend the graduate instruction to other divisions of the department, and to increase the number of courses and of instructors in subjects already given.

EQUIPMENT

For the most part, and except in landscape gardening, the same equipment is used for instructional and for investigational work. The area devoted to these operations consists of 320 acres in the vicinity of Urbana; in addition, various fruit and vegetable plantations are maintained by the department in southern Illinois for spraying and soil experiments in pomology, and for plant selection and fertilizer experiments in olericulture.

Two buildings are devoted exclusively to horticultural activities. The Floriculture greenhouses (erected 1912-13) consist of ten glass houses with an aggregate area of 28,000 square feet. The service building used in connection with the greenhouses is a two-story structure containing laboratories, offices, classrooms, and potting and storage rooms. Six of the glass houses are used for instruction, and the other four for investigational work. The houses contain plants representing all forms used in commercial and decorative work. The Vegetable and Plant Breeding greenhouses (erected 1912-13) consist of three glass houses,—one used for vegetable growing (105 x 28 feet) and two for plant breeding (each 80 x 30 feet); a wire house 80 x 30 feet; and a two-story service building.

The landscape gardening classrooms and offices are in the Agricultural Building. Four drafting rooms, containing in all one hundred desks, modern filing devices for office practice, and a very complete library are at the disposal of the students. The library contains an unusual collection of early works on landscape gardening, a collection which was begun with the opening of the University in 1868; it has been kept up to date in both American and foreign publications relating to landscape gardening and allied subjects. A series of two thousand lantern slides is used to illustrate lectures and laboratory work. There is also a collection of representative drawings and blue-prints by practicing landscape architects.

EXPERIMENTAL WORK

POMOLOGY

In Pomology, or fruit growing, the investigational work consists largely of soil-treatment and spraying experiments for apple orchards of central and southern Illinois. The soil-treatment experiments necessarily cover a considerable period of years. A new experiment with nitrate of soda is planned for the coming season.

During 1916-17 the spraying experiments for blotch demonstrated the superiority of Bordeaux to lime sulfur, but indicated that Bordeaux applied in sufficient amounts to control blotch resulted in badly russeted fruit. It was found that the most important sprayings for blotch were those applied three, five, and seven weeks after the fall of the bloom.

Results from the test of the dust sprays, in which powdered arsenate of lead and finely divided sulfur were used, indicate in general a rather favorable control of codling moth and curculio, with an unsatisfactory control of apple scab and blotch.

Investigations with regard to spraying peaches and to the control of pear blight are now in progress.

OLERICULTURE

In Olericulture, or vegetable gardening, experiments are being carried on with a view to studying inheritance in lettuce and to securing a better



STUDENT DESIGN FOR SMALL HOME GROUNDS

forcing variety of head lettuce. A number of commercial varieties of tomatoes are being tested to determine their relative resistance to fusarium wilt. Experiments in sweet potato selection are being conducted for the purpose of isolating types of sweet potatoes found in the ordinary seed and of developing by selection, if possible, improved strains of sweet potatoes.

A fertilizer experiment with tomatoes, sweet potatoes, and muskmelons has been inaugurated for the purpose of determining the fertilizer needs of these crops in a three-year rotation.

FLORICULTURE

In Floriculture, fertilizer experiments show that acid phosphate increases the production of carnations, and has the same effect with roses of every variety tested, except Hoosier Beauty.

One of the chief investigations during the present year is the study of the effect of fertilizers on the formation of carbohydrates in plants; it has been necessary to devote considerable time to a preliminary study of methods of carbohydrate analysis in order to secure a basis for reliable and significant results.

Three projects of general horticultural interest have been started in this division: (1) the chemical changes taking place in the ripening of fruits; (2) the carbon-dioxid content of the greenhouse atmosphere; and (3) the chemical changes resulting in apples from attacks by *Penicillium*.

The work in pathology is directed along three lines: (1) giving information as to disease and treatment in cases of trouble in commercial greenhouses; (2) the diagnosis of diseases for other divisions and departments upon a request for such information; and (3) the experimental investigation of those diseases which at present are resulting in the most serious loss to the grower, more especially carnation "yellows," the fusarium wilt of carnations, snapdragon rust, and aster "yellows." With all of these the aim is to give an ample and easily recognized description of the disease, the method of transmission, the effect on the structure and tissues of the plant, and either to develop a remedy or devise methods of preventing the occurrence of the disease.

A survey of the fungus flora of greenhouse soils is also in progress.

New diseases of floricultural plants which have recently come to attention are a bacterial decay of cyclamens, a crown blight of *Ligustrum vulgare*, and a destructive disease of canna rootstock. New or noteworthy diseases other than floricultural that have been met are as follows: a *Phoma* canker of apple, new to the state, if not to the United States; the bacterial shot hole of peach and plum, caused by *Bacterium pruni*, not previously reported from this state; a *Cytospora* blight of plum, peach, and apple showing interesting inter-host relations; a disease seemingly caused by *Calosphaeria princeps* which results in the death of cherry and plum trees; the blight of

sweet corn caused by *Pseudomonas stewarti*, previously unreported for the state; a new bacterial chlorosis of field corn; and a leaf blight of the cowpea.

PLANT BREEDING

Plant-breeding projects originally outlined in 1907 are being conducted.

The studies in apple-bud selection have shown, in a positive way, that so far as growth is concerned, there is no difference in value, for purposes of propagation, between large buds and small buds, or between buds differently situated either on the tree or the shoot.

Hybridizing between standard varieties of apples and other species of the genus *Malus*, crossing between orchard varieties, crossing between strains of the same variety and even between different individuals of the same strain are all being tried in order to determine the effect of pollination. Studies are in progress with regard to the transmission of characters such as size, type of foliage, flower color, flower form, color of seed, and shape of the pollen, sweet peas being used for the purpose because they are well adapted to studies of this kind.

Peach breeding is being carried on with 3,400 trees now in the plantation and with about 30 hybrid seedlings now growing in the greenhouse; these latter plants are utilized to the fullest extent this spring, crossing as many as possible and selfing the balance.

EXTENSION WORK

The members of the Horticultural Department devote a relatively small proportion of their time to extension activities, not because there is no demand for such work, but because other and more pressing duties occupy their time. It will be necessary to increase the staff before this phase of the horticultural work can receive proper attention.

Many people are reached thru a large correspondence. Lectures have been received favorably and for the most part eagerly, but have been restricted to a small number of localities.

EXHIBITS

Three exhibitions are held annually by the department. A Chrysanthemum Show is held in November every year; a Fruit and Vegetable Exhibit is held in connection with the meetings of the Illinois Horticultural Society, in December; and in April an Exhibition of Floral Arrangements is given by the class in floral arrangements.

In 1916 a Vegetable Exhibit, including charts and pictures, was held in connection with the Vegetable Growers' Convention at Chicago. And during 1916-17, the following exhibits were given by the division of Landscape Gardening: the work of Charles Downing Lay, of New York City; Von Penhallow Henderson pastels; prize drawings from the American Academy in Rome; and an exhibit from the Massachusetts Agricultural College at Amherst.

PUBLICATIONS

The following bulletins and circulars have been published by the department since 1901:

BULLETINS:

- 61 The Farmer's Vegetable Garden
- 67 Apple Scab
- 68 Important Details of Spraying
- 70 Canker of Apple Trees
- 77 Bitter Rot of Apples
- 81 Forcing Tomatoes
- 98 The Curculio and the Apple
- 105 The Farmer's Vegetable Garden
- 106 Relative Merits of Liquid and Dust Spray
- 114 Spraying for the Codling Moth
- 117 Bitter Rot of Apples (Horticultural Investigations)
- 118 Bitter Rot of Apples (Botanical Investigations)
- 124 Marketing the Muskmelon
- 144 Growing Tomatoes for Early Market
- 155 Fertilizer Experiments with Muskmelons
- 174 An Efficient and Practicable Method for Controlling Melon Lice
- 175 Experiments in Onion Culture
- 176 The Use of Commercial Fertilizers in Growing Carnations
- 184 Tests with Nitrate of Soda in the Production of Early Vegetables
- 185 Field Experiments in Spraying Apple Orchards
- 188 Methods of Fertilizing Sweet Potatoes
- 189 Parasitic Rhizoetoniae in America
- 196 The Use of Commercial Fertilizers in Growing Roses

CIRCULARS:

- 37 Apple Fruit Rots
- 39 Directions and Formulas for Spraying
- 40 The Farmer's Fruit Garden
- 41 Small Fruits for the Northern Half of the State and How to Grow Them
- 42 Fruit List for Northern Illinois
- 43 Field Work with Bitter Rot During 1901
- 44 Fruit Storage Experiments
- 45 Vegetables for a Farmer's Garden in Northern Illinois
- 46 The Farmer's Flower Garden
- 47 The Window Garden
- 58 Prevention of Bitter Rot
- 67 Fruit and Orchard Investigations
- 107 Fruit and Orchard Investigations
- 112 Control of Bitter Rot of Apples
- 120 Spraying Apple Orchards for Insects and Fungi
- 139 How to Grow Muskmelons
- 154 The Home Vegetable Garden
- 160 Some Common Spray Mixtures
- 170 The Illinois Way of Beautifying the Farm
- 172 The Blight of Apples, Pears, and Quinces
- 173 Onion Culture

- 176 Practical Helps on Landscape Gardening
- 182 The Fertilizer Problem from the Vegetable Grower's Standpoint
- 184 The Prairie Spirit in Landscape Gardening
- 187 A Serious Disease of Cultivated Perennials Caused by *Sclerotium Rolfsii*

Publications on the following subjects are now in preparation: field experiments in spraying apple orchards; seed production in apples; apple-bud selection; vegetable gardening; and the mechanical effects of sprays on the epidermis of the apple leaf.

NEEDS OF THE DEPARTMENT

Buildings. With the relinquishing of our claim on the old Horticultural Building and adjacent grounds, now used for military purposes, there are in process of development new out-door field laboratories for courses of instruction in commercial orcharding, small-fruit growing, and vegetable gardening. These laboratories are located on a 320-acre tract at the south-east extremity of the campus. Adequate provision must be made without delay for the drainage, fencing, road-making, and planting of this area. This out-door equipment must be supplemented at once with interior laboratory and storage space, and for this purpose there has been designed the group of three buildings shown opposite page 19. The main building of this group is a structure 160 x 57 feet, joined to which is a storage house 70 x 50 feet, with stables and machinery space adjacent, 153 x 36 feet.

Greenhouses. The increasing demands for instructional work, especially of graduate grade, in olericulture and pomology make it imperative that provision be made at the earliest possible moment for an additional vegetable house 105 x 28 feet, and two new houses for the growing of fruits under glass, each structure to be 105 x 28 feet.

Similarly the increased registrations in floriculture make it necessary to provide at least two new houses in the very near future.

Each of these five houses will cost approximately \$3,500, making a total of \$17,500. The floricultural work of the University will never be adequately developed until there is provided the large palm house referred to in former reports.

Research. The most pressing need of the department in the field of research at the present time is the securing of a thoroly trained pomological chemist, and a plant pathologist and physiologist, each to devote his entire time to experimental problems relating to fruit growing and vegetable gardening. Similar appointments have already been made and satisfactory equipment provided in the division of Floriculture.

Landscape Gardening. The demand for instructional work in landscape gardening and the necessity of greatly expanding our extension activities in this field make it absolutely necessary that additional quarters be provided for this work. Three new men must also be added to this work the coming year.



THE WOMAN'S BUILDING

In the north wing of which are located the classrooms and laboratories of
the Household Science Department

THE HOUSEHOLD SCIENCE DEPARTMENT

Prepared by Isabel Bevier, Head of Department

THE Household Science Department of the University of Illinois is instructing 525 young women in the principles and processes of home-making and housekeeping. For convenience, the work is arranged under the sanitary, esthetic, and economic aspects of food, clothing, and shelter. But whatever the method of approach, two fundamental conceptions obtain: first, that housekeeping and home-making is big business whether one considers the capital invested or the ultimate good of the individuals concerned; second, that it requires for its successful prosecution, training in the processes involved in housekeeping and a knowledge of the materials to be used.

Each passing year emphasizes more strongly the necessity for skilful buying, for careful expenditure of energy, time, and money, both within and without the home, but the necessity for cherishing the less tangible elements of individual and family life is quite as imperative if not so evident. So it is a matter of congratulation that the department has strengthened its work for the family by the addition of a worker trained in economics who, therefore, can consider the family not only in its social but also in its economic aspects.

Two hundred and thirty-six young women are working with food, some in selection and preparation, others practicing housekeeping in the apartment, and yet others studying lunch-room management in the preparation of food for the cafeteria (in which the average daily attendance for the month of February was 317). This shows that the department itself is a great laboratory for the study of the many phases of the food supply, such as suitable diet for old and young, sick and well, the cost, selection, and preparation of food, as well as a place in which the student learns both theory and practice.

The world is slowly but surely coming to recognize the value of beauty in common life, which means bringing art into the daily task. The art side of the work of this department is concerned, not only with teaching the value of textile fibers in order to make the woman a successful buyer in these lines, but also with showing her the value of form, line, color, and design as applied to either the clothing of the family or the furnishing of the home, to the end that the home and its furnishings shall be not only useful but beautiful. At present, 280 girls are studying along this line.

No small amount of energy goes into the training of teachers. At present, 78 young women of the senior class are doing their practice teaching, under supervision, in the schools of Champaign.

While the larger number of women find their places ultimately in the home, many of them reach it thru the occupation of teacher, the dietitian, the social worker, the lunch-room manager, or the interior decorator. The

offerings of this department, therefore, as outlined in the 18 undergraduate, 4 graduate, and 6 Summer Session courses, are planned to give the student the fundamental knowledge and the method of attack of the problems incidental to these lines of work as well as to those of the home-maker.

STATISTICS SHOWING PRESENT OCCUPATION OF GRADUATES

The following statistics show the different kinds of work in which our 305 graduates are engaged at the present time:

Married	75
At home	56
	—
Total in homes.....	131
Teaching (universities, colleges, normal and high schools, Y. W. C. A.'s, etc.....	135
Cafeteria and tea-room directors.....	14
Dietitians	8
Miscellaneous	17
	— 305

GROWTH IN ENROLLMENT

The following figures are indicative of the growth of the past five years, and therefore helpful in plans for future growth:

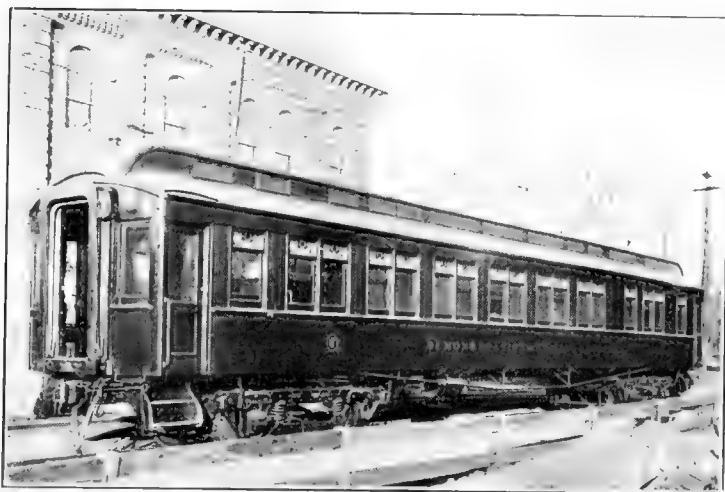
YEAR	STUDENTS	FACULTY
1912-13	358	9
1913-14	406	
1914-15	421	
1915-16	469	
1916-17	525	16

In other words, the gain in students in this department during the past five years has been 45 percent, and for the past biennium, 25 percent, while the undergraduate courses have increased from 16 to 18 and the graduate courses from 2 to 4. The growth is further evidenced by the fact that three-fourths of the graduates belong to the last five years, and that the class of 1917, numbering 93, is more than three and one-half times as great as the class graduated in 1912. Then the regular instructional staff numbered 9, at present it numbers 16.

This increase in enrollment and in graduates indicates that the people of the state have a growing interest in home and family life and in the training of women to meet the different phases of the problem.

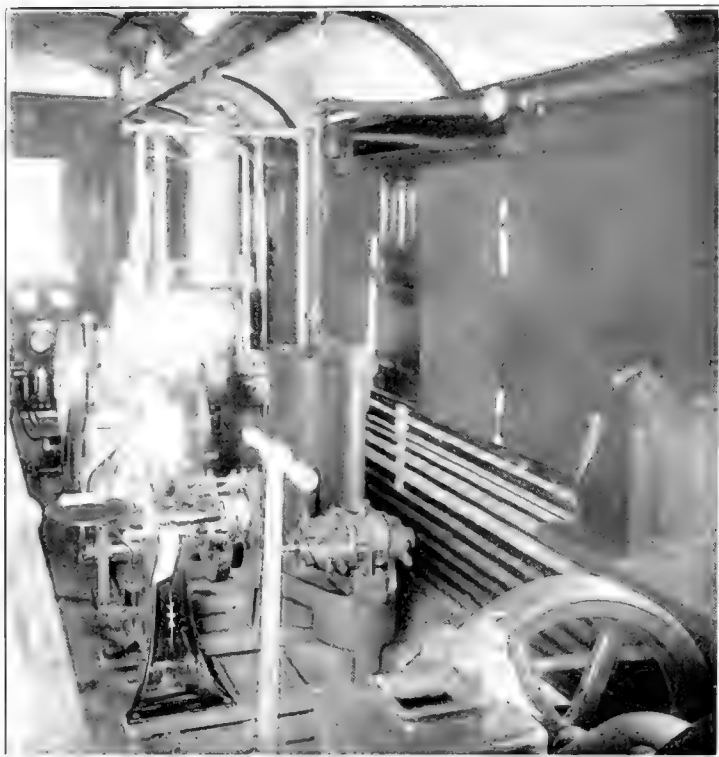
EXTENSION WORK

The extension work of the Household Science Department is particularly important because it deals with questions vital to individual and community life, in fact with their very essentials—food, clothing, shelter, and health. The agencies employed are:



HOME ECONOMICS DEMONSTRATION CAR

Shows types of light, heat, water, and power installations for the country home; also types of furnishings and equipment



POWER MACHINERY IN DEMONSTRATION CAR

1. Correspondence
2. Service for organizations, such as the Farmers' Institute, Parents' and Teachers' Associations, etc.
3. Movable Schools
4. Demonstration Car
5. School for Housekeepers

This extension service is announced by a special circular and can be had by any community upon request. The work is conducted by a regular staff of six, supplemented, because of the large number of calls, by six part-time workers. Almost every phase of home life has been presented by these workers in 31 movable schools and 88 lectures given from July 1, 1916, to January 1, 1917. It seems probable that the total attendance at the schools and lectures this year will be considerably in excess of the 50,000 attending last year. The following figures give the numbers served from July 1, 1916, to January 1, 1917.

By separate lectures and demonstrations.....	12,648
By Movable Schools	7,926
By Demonstration Car (November and December only) ..	4,152
	24,726
Letters and cards sent out in regular correspondence...	1,558
Bulletins sent out.....	18,817

Numbers served for the month of January, 1917:

By separate lectures and demonstrations.....	2,091
By Movable Schools	3,469
By Demonstration Car	1,955
	7,515
School for Housekeepers at the University.....	657
	8,172

PUBLICATIONS

The following bulletins are written for the benefit of housekeepers and teachers, and aim to present simply and clearly the scientific results as determined in the laboratory.

- The Principles of Jelly Making
- Some Points in Choosing Textiles
- Some Points to be Considered in the Planning of a Rational Diet
- Some Points in the Making and Judging of Bread
- The Cooking of Carp
- The Service of Meals
- The Planning of Meals
- The Rural School Lunch
- Syllabus of Domestic Science and Domestic Art for the High Schools of Illinois

Outlines for Work in Domestic Science and Domestic Art for the
Elementary Schools of Illinois
Announcement of Extension Service in Household Science
Home Economics Demonstration Car

SPECIAL FEATURES OF EXTENSION WORK

Three features of the extension work deserve special mention—the health work, the demonstration car, and the county adviser.

The health work is conducted by a woman trained in home economics and in nursing. It deals with questions of home sanitation, personal hygiene, emergencies, first aid, and the care of the mother and child. When statistics show that the death rate of children is higher in the country than in the slum districts of our crowded cities, it is time something were being done for the country child. In order that the Household Science Department may be ready to do its part in the event of war, this instructor has prepared to give the work outlined by the Red Cross organization, and is offering work in the Summer Session under the name of Community Health. During the year January 1, 1916, to January 1, 1917, she delivered 225 lectures and demonstrations in 32 counties of the state.

HOME ECONOMICS DEMONSTRATION CAR

The Household Science Department has equipped a demonstration car which is at the service of any community of the state.

This car marks a new departure in extension work. Hitherto, demonstrations in Home Economics have been confined largely to the cooking of food. It is the purpose of this car to extend this method of presentation to *power equipment* and *house furnishings*; to actually show machines, kitchen utensils, and color schemes, not just to talk about them.

In accordance with this idea, this car shows how power commonly used upon the farm may also be employed in performing a large part of the heavy labor of the home; how to secure an adequate water supply for both the house and barn with the necessary provision for sewage disposal; and, finally, how, by attention to equipment and to the principles of form and color, the essentials of comfortable living may be secured for the country home at a reasonable cost.

The equipment consists of:

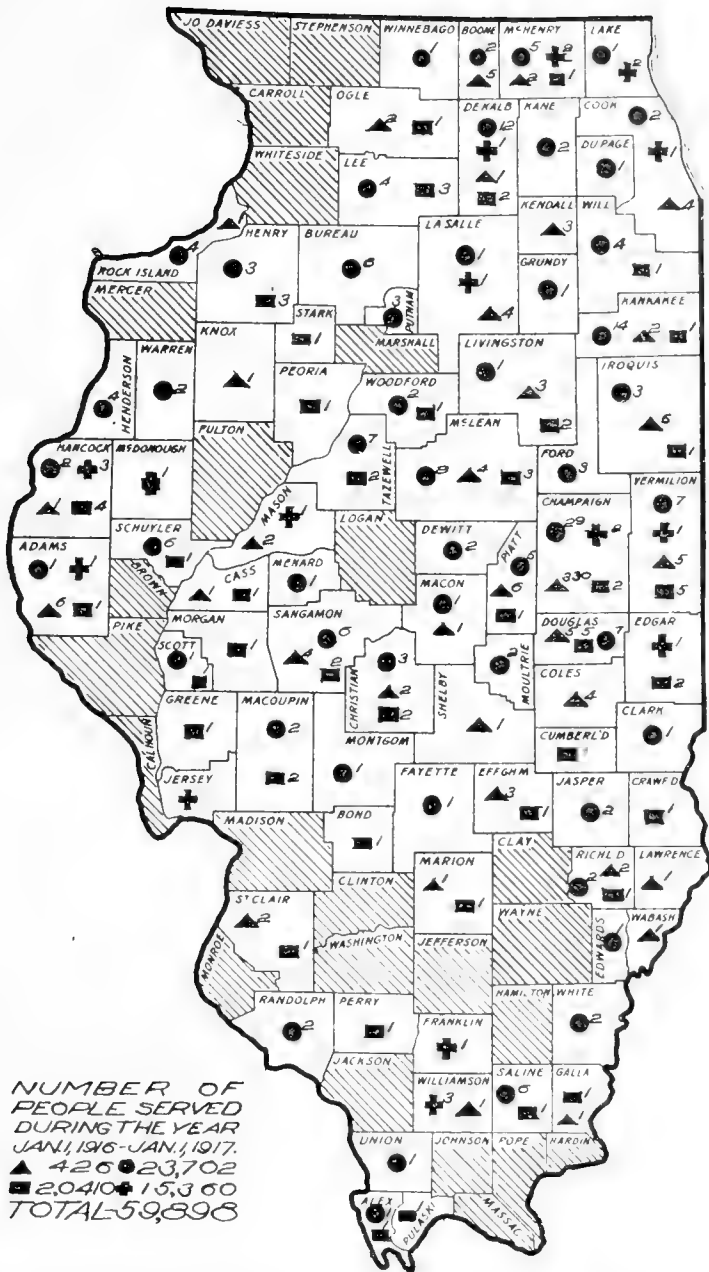
I. A gasoline engine operating the washing machine, mangle, cream separator, vacuum cleaner, ice cream freezer, etc.

II. Installation of a hot and cold water system under pressure for house and barn, operated by the same machine.

III. Electric lighting system for private home.

IV. Septic tank and sewage disposal.

V. House furnishings. This includes a great variety of furnishings from kitchen utensils to furniture and color schemes for the living room



- ▲ COUNTIES REPRESENTED AT SCHOOL FOR HOUSEKEEPERS WITH FIGURES, INDICATES NUMBER OF SEPARATE LECTURES AND DEMONSTRATIONS.
- WITH FIGURES, INDICATES NUMBER OF ONE-WEEK DEMONSTRATION SCHOOLS.
- WITH FIGURES, INDICATES NUMBER OF WEEKS OF DEMONSTRATION CAR SERVICE.
- + WITH FIGURES, INDICATES NUMBER OF WEEKS OF DEMONSTRATION CAR SERVICE.
- ▨ COUNTIES HAVING NO SERVICE.

and the bed room, so that the housekeeper may see how, if care is given to color, texture, and quality, a house may be furnished attractively at a reasonable cost, and also how time and energy may be saved by the wise selection of utensils and by system in their arrangement.

The car and its equipment provide sufficient material for demonstration work for a week. It is designed to reach housekeepers under conditions favorable to a thoughtful study of the equipment, so it is not feasible to use the car in connection with a movable school, a farmers' institute, or as an addition to other enterprises. It is proposed to spend five days at a point. The general plan is to have the car open each morning for inspection with two demonstrators to explain the equipment; to have a demonstration each afternoon, and a lecture in the evening in a suitable hall. This arrangement of time leaves opportunity, if desired, for the demonstrators to visit a farm home for the purposes of inspection and suggestion.

The work of the demonstration car and of the county adviser are conducted under the provisions of the Smith-Lever Act and in cooperation with the United States Department of Agriculture. The car seems the best possible way of carrying to the rural communities ideas and suggestions for home equipment.

COUNTY ADVISER IN HOME ECONOMICS

It is a matter of congratulation that Illinois was the first of the northern states to undertake the maintenance of a county adviser for women. This work is conducted in cooperation with the women of Kankakee county under the name of the Home Improvement Association. It is now in the second year of its development and bids fair to add a substantial increase to the 6,000 people served last year.

NEEDS OF THE DEPARTMENT

The statement of the work now in progress makes very evident the great need of the Department—*adequate provision for maintenance and growth*, so that by the time the last year of the biennium is reached there will remain sufficient funds to meet the increased demands due to growth. As a matter of fact, the expenditures for this year have been reduced to the buying only of that which was absolutely necessary for student use. Investigation, publication of extension bulletins, and the purchase of equipment of all kinds, have been postponed because the funds have necessarily been expended in caring for the increased demands for student instruction.

The Woman's Building serves as an attractive and convenient laboratory for the Household Science Department. It will afford sufficient space for another biennium, but the equipment both of faculty and of materials must be greatly enlarged in the immediate future if this Department is to meet its responsibilities and opportunities for service in the homes and health of the people of Illinois.

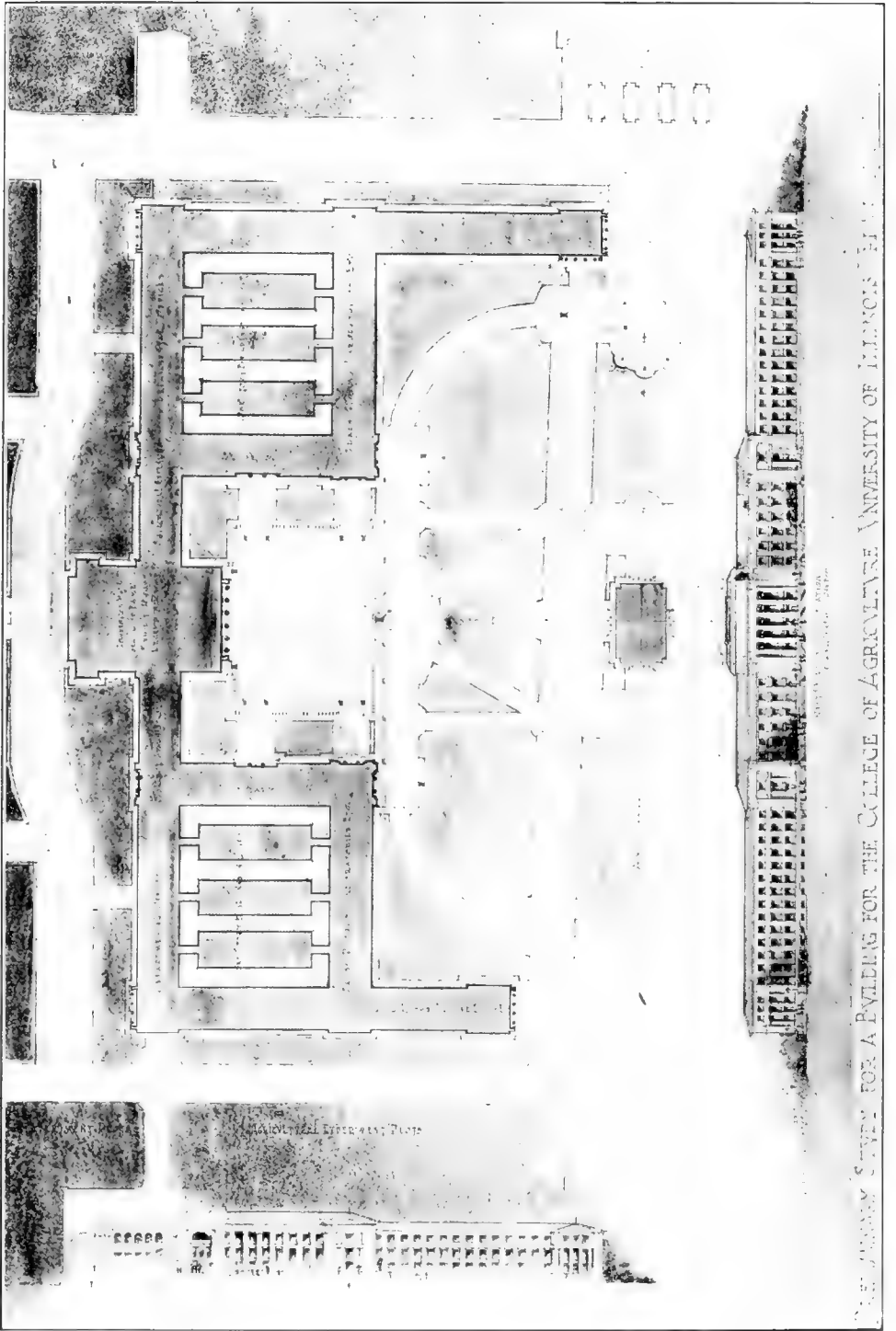
SMITH-LEVER EXTENSION

FROM the first the outside activities of the College of Agriculture have been very great. Members of the faculty have been called upon to attend thousands of meetings and discuss with farmers the progress of investigations and the newer methods of agricultural practice. So has deep cultivation of corn been made to give place to shallow cultivation; so has exhaustion of the soils of the state been arrested by a better care of our stock of fertility and the establishment of a really permanent system of agriculture.

The value of this outside work has been widely recognized. Until recently it has been mostly promoted by people already overworked in the classroom or the laboratory, but in the spring of 1914 Congress passed what is known as the Smith-Lever extension bill by which was established in every state of the union a definite demonstration service both in agriculture and in home economics.

The amount to come to Illinois from the federal treasury under the Smith-Lever Act for the coming year is \$80,085.86, which is available for demonstration service, mainly under a system of county advisers supported jointly by the local associations and this fund. Under this plan twenty-three counties are now in full operation, with advisers whom they themselves have employed after meeting three conditions imposed by the College of Agriculture, which is made the custodian of the Smith-Lever fund. The three conditions are that the adviser must be a college graduate; that he must have actually lived upon the farm for at least five years; and that he must have had at least five years' successful experience in some line of agricultural work since graduation.

The Smith-Lever work in home economics has already been outlined in the Household Science section of this report.



PROPOSED STUDY FOR A BUILDING FOR THE COLLEGE OF AGRICULTURE UNIVERSITY OF ILLINOIS

WHAT THE AGRICULTURAL COLLEGE AND EXPERIMENT STATION NEED

THE growth of the agricultural work of the University has been beyond all expectation, and the demands upon the institution have overtaken and are far exceeding its facilities. What the institution needs in order to meet these demands is:

First. A stronger faculty

Second. The strengthening of certain lines of work

Third. Additional room

I. A STRONGER TEACHING FACULTY

The real teaching power of the agricultural faculty is greatly reduced by the fact that over one-third of the staff must give their entire time to the work of the Experiment Station, extension, and administration; while some three-fourths of the remainder give part time to experiment station work, extension service, or graduate study. Effective service in the classroom is still further reduced by the fact that much of the equipment of the College of Agriculture is in fields and herds that require a very great amount of labor in their proper care.

The actual result is that even tho men are overworked, they are still unable to give sufficient attention to the student body. The only relief is a substantial addition to the number of the agricultural staff.

The University of Illinois has been slowly beating its way upward among the institutions of the country in paying salaries sufficient to hold in its service the picked men of the faculty. In this it has been fairly successful, especially in later years, but new conditions are bringing new demands, and unless the resources of the College of Agriculture can be substantially increased, we shall be unable to maintain that tested body of teachers and investigators without which the University would be unable to render satisfactory service.

It is inevitable that a considerable portion of a faculty must consist of young and inexperienced people still in the list of learners, because in no other way can instructors and investigators be trained. It is also inevitable that if these men are to live normal lives, they must be paid, even while completing their education and training, salaries sufficient to provide the necessities; otherwise the supply of faculty material will be cut off at its source.

Until the present time we have been able to secure these young men at very moderate salaries, so moderate that the wages now paid to janitors frequently equal and in some cases exceed salaries paid to assistants. Clearly, the increased cost of living indicates that something must be done at this point. Besides, a new competition is springing up from neighboring institutions.

If there were a reliable and adequate supply of faculty material, the institution would be freed from much embarrassment in the training of teachers and investigators, and the service could be much more cheaply and effectively rendered, but such a supply does not exist and the University of Illinois, like all other of the larger institutions, has no choice but to do its share in the preparation of teachers and research men.

II. THE STRENGTHENING OF CERTAIN LINES OF WORK

No marked additions have been made to the offerings in the College or the work of the Experiment Station during the last half dozen years. In the meantime certain subjects have come to the front which have been either entirely neglected, or undertaken only in a feeble way: for example, Farm Organization and Management, involving the study of farming from the standpoint of economics rather than of chemistry or biology; research work in Farm Machinery, which has been studied mainly from the standpoint of the designer, not the operator; Poultry husbandry, which is beginning to be a large subject in a state like Illinois; more exhaustive work in Animal Diseases, particularly with reference to the instruction of agricultural students in the care of live stock; a considerable increase in facilities for instruction and research in new phases of the Food Problem both from the public and the private point of view, with further work in Home Nursing; and extension work with boys and girls in agriculture and home economics both in connection with schools and with local clubs.

Such new and important subjects should be equipped for the best grade of instruction, and in some cases for research as well.

Besides such subjects of generally recognized importance, there are others, like bee-keeping, which have long pressed upon the attention of the University and which have been neglected for no other reason than lack of funds. Vast amounts of honey are going to waste in the forests and fields simply because a sufficient stock of bees is not maintained for its gathering. Scanning our possible resources in this fashion, we should find many other enterprises which ought to be seriously undertaken, but the problem is so vast that only the most pressing needs can be met at the present time. Even so, considerable additions of funds are necessary.

In a very considerable sense the Agricultural College and Experiment Station have been marking time in recent years. The present budget, exclusive of buildings, is but 5 percent higher than the budget four years ago; whereas the student registration has increased 32 percent, the agricultural faculty 27 percent, the graduating class 136 percent, and the graduate students 200 percent.

In order to live with the situation at all, we have been forced to close certain classes against additional students even on the first day of registration, and we have been obliged to greatly change the conditions for graduation in order to give the students wider liberty in finding courses not

filled and which might be offered for credit. We have about reached the limit even of these devices, and something significant will have to be done without delay if the College is not to be injured and students actually turned away.

To strengthen the faculty and enable it to meet the increased demands in both old and new lines of work, and to provide proper equipment for the same will require additional funds to the amount of not less than \$125,000 annually.

III. ADDITIONAL ROOM

Six years ago upon the recommendation of a committee of citizens which visited half a dozen other institutions, the Trustees of the University asked the Legislature for \$337,500 for an addition to the Agricultural Building. During the session it became necessary to sacrifice either this asking or the increased funds for maintenance. With the conditions threatening, the building was sacrificed in the interest of caring for students, hoping that space would make itself available. The wisdom of this move was shown by the fact that since that time (1911) the student attendance has increased over 64 percent. Without the funds provided at that time, it would have long ago become necessary to turn away agricultural students.

We have, however, been pressed for room even beyond our anticipation six years ago.

In spite of additional space provided in the new Stock Judging Pavilion and the Floricultural laboratories, we have been obliged to roof over the court of the Agricultural Building and also erect a temporary structure for genetics. After doing this, we have overflowed into all sorts of available buildings, even into private houses, until the offices of the College of Agriculture are scattered in ten different buildings upon the campus—from Springfield avenue on the north to the Stock Judging Pavilion nearly a mile to the south. Clearly, this scattered condition makes the best work impossible.

UNABLE TO SERVE STUDENTS

Besides, we are unable properly to serve the students. The laboratory equipment of certain courses is so far below the present registration that many students are unable during their entire sojourn to get the instruction they came especially to receive.

The inevitable result of such a condition of things is best pointed out by calling attention to the fact that since 1900 there has been an average annual increase in students of 65, in recent years approaching and sometimes exceeding 100 (1912, 100; 1913, 76; 1914, 109; 1915, 170; 1916, 71), until the present year, in which the registration has fallen off something more than 50. When an annual increase of approximately 100 becomes a decrease of 50, it is time to consider the conditions and take stock

of the situation, particularly when the registration in the University as a whole has increased during the present year as in other years.

It is of course impossible to state to what causes this decreased attendance is due, but remembering that the attendance in the institution as a whole has increased while that in Agriculture has suddenly decreased after sixteen years of rapid rise, the suspicion is well founded that our inability to meet the demands of the students as they ought to be met is responsible for at least a good proportion of this decline, particularly as the decline set in last year (the increase being 71 as compared with 170 and 109 in the two former years). Students have noticed these limitations to our work and have been talking about them for three or four years. As this condition becomes chronic, it cannot but deter students from coming or send them to other states.

POSSIBILITIES FOR RELIEF

There are but three things that can be done to relieve the situation:

First. Limit the attendance of students, frankly cutting down the number to those that can be accommodated under present conditions.

Second. Put up temporary structures to be wrecked after a few years.

Third. Provide at the earliest possible moment properly constructed permanent buildings.

Clearly, the public would not approve the policy of turning away students. The construction of temporary buildings to be wrecked in a few years would only postpone the problem, not solve it. The erection of anything but permanent buildings is not feasible; first, because, with valuable records, the fire risk in any but permanent buildings is too great; and second, because the repair of such buildings under the heavy uses of a university soon comes to cost more than the buildings are worth.

THE ONLY FEASIBLE SOLUTION

The only feasible solution is a fire-proof construction of the most durable sort, plain in its architecture but adapted to the purposes of university work.

Inasmuch as the present Agricultural Building stands on a portion of the campus which in the growth of the University is needed for purposes other than agriculture, this plant should be erected upon the South Campus, and it should be large enough to shelter the entire classroom, laboratory, and office needs for both the College of Agriculture and the Experiment Station. To do this it must provide not less than 300,000 square feet of floor-space, which for fireproof, permanent, and creditable construction according to architects' estimates will cost \$2,000,000.

This is a very large sum of money; but when it is remembered that the Massachusetts Institute of Technology has just invested \$7,000,000 in an engineering plant, and that a new Illinois Agricultural College building should take care of the educational needs of more than 2,000 students, with offices, laboratories, library, and other equipment for faculty work, the amount is clearly a minimum.







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